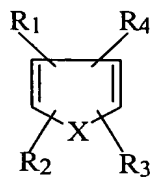


## CLAIMS

We claim:

1. A method for treating sickle cell disease in a patient in need thereof, comprising the step of administering to said patient a compound of formula



where

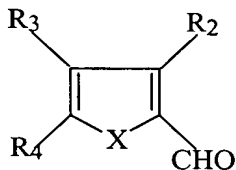
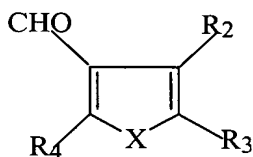
R1 is CHO, or an aldehyde protecting group;

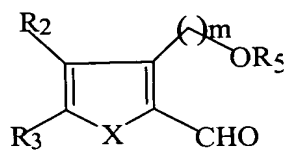
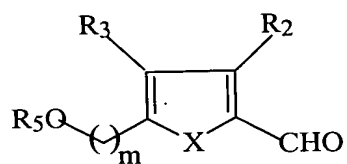
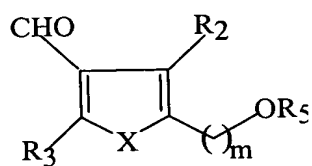
R2, R3 and R4 are the same or different and are H, OH, alkyl, alkoxy, hydroxy-alkyl, halogen, aryl or O-aryl;

and X = NH, O, S, Se or P;

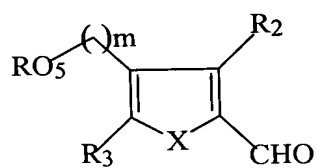
and wherein said compound is administered in sufficient quantity to ameliorate symptoms of sickle cell disease.

2. The method of claim 1, wherein R1 is CHO; R5 is H, alkyl or aryl; and m = 1-6; said compound being selected from the group consisting of

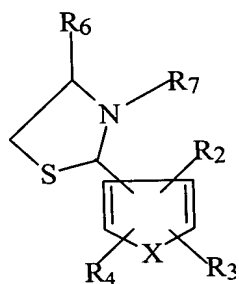




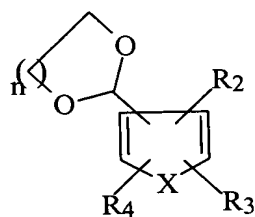
and



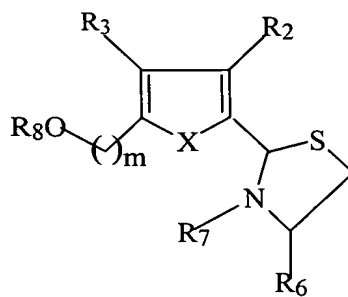
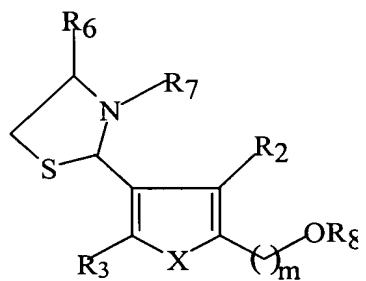
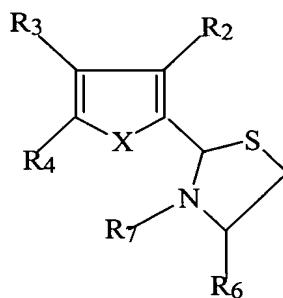
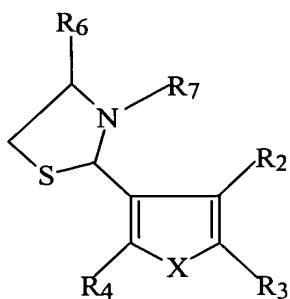
3. The method of claim 1, wherein R1 is a heterocyclic ring; R6 and R7 = H or alkyl; and n = 0-4; said compound being selected from the group consisting of

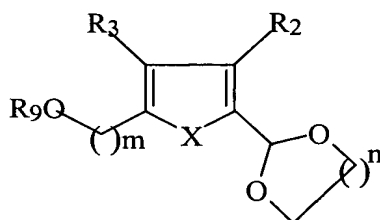
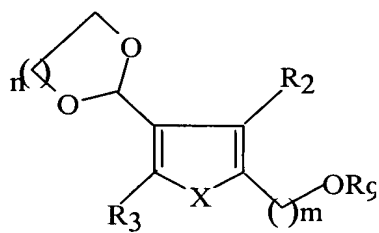
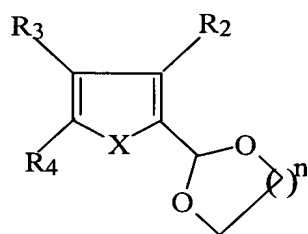
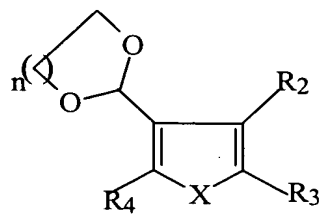
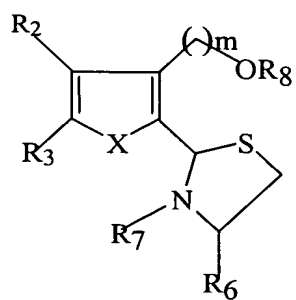


and

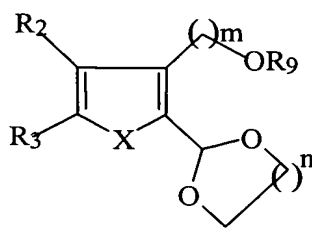


4. The method of claim 3, wherein R8 and R9 = H, alkyl or aryl, and said compound is selected from the group consisting of

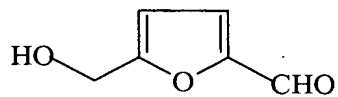
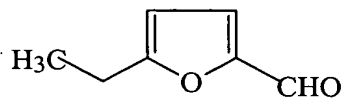
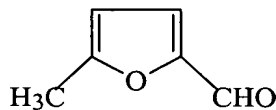




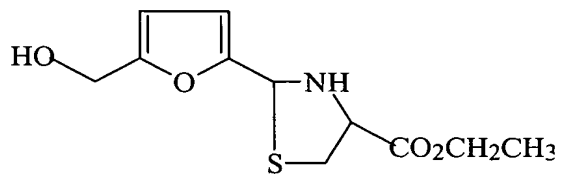
and



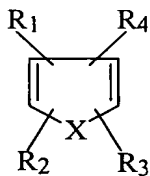
5. The method of claim 1, wherein said compound is selected from the group consisting of



and



6. A method for treating jaundice in a patient in need thereof comprising the step of administering to said patient a compound of formula



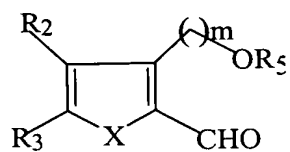
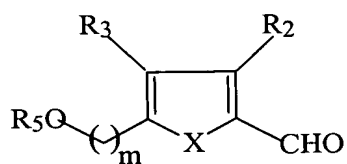
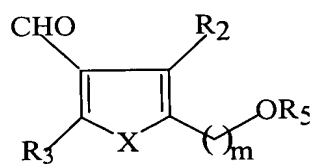
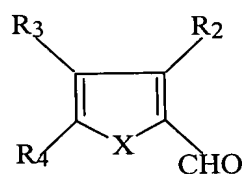
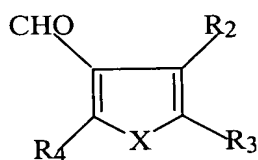
where

R1 is CHO, or an aldehyde protecting group;

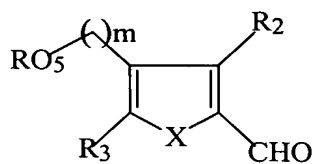
R<sub>2</sub>, R<sub>3</sub> and R<sub>4</sub> are the same or different and are H, OH, alkyl, alkoxy, hydroxy-alkyl, halogen, aryl or O-aryl;  
and X = NH, O, S, Se or P;

and wherein said compound is administered in sufficient quantity to ameliorate symptoms of jaundice.

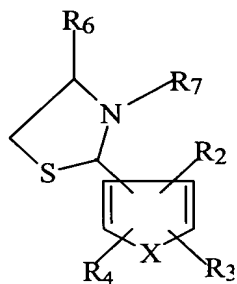
7. The method of claim 6, wherein R<sub>1</sub> is CHO; R<sub>5</sub> is H, alkyl or aryl; and m = 1-6; said compound being selected from the group consisting of



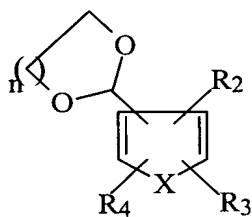
and



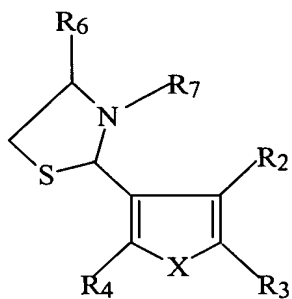
8. The method of claim 6, wherein R1 is a heterocyclic ring; R6 and R7 = H or alkyl; and n = 0-4; said compound being selected from the group consisting of

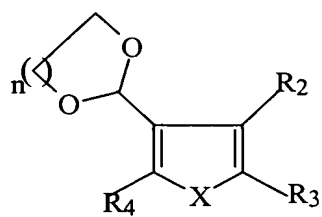
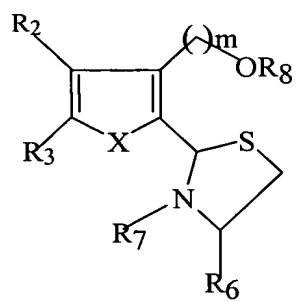
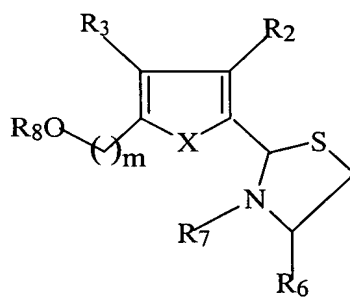
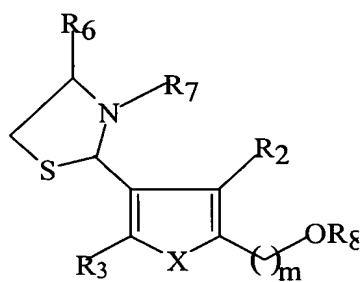
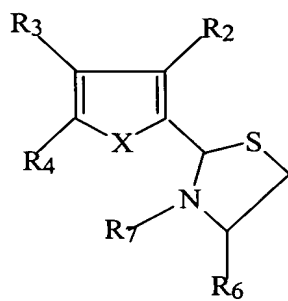


and

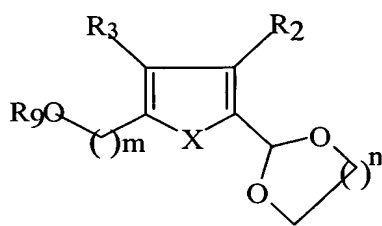
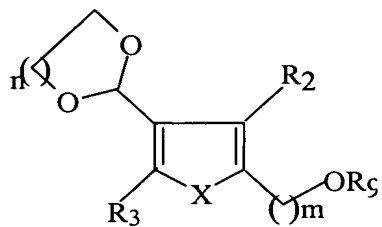
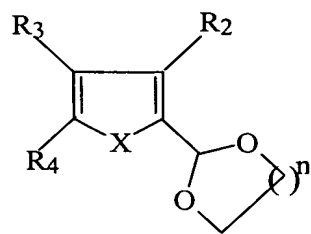


9. The method of claim 8, wherein R8 and R9 = H, alkyl or aryl, and said compound is selected from the group consisting of

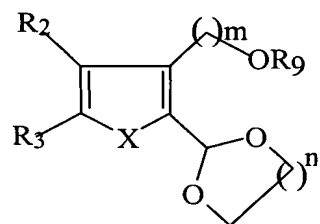




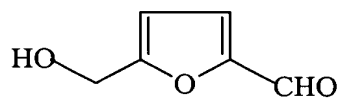
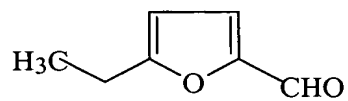
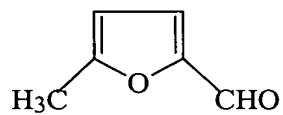




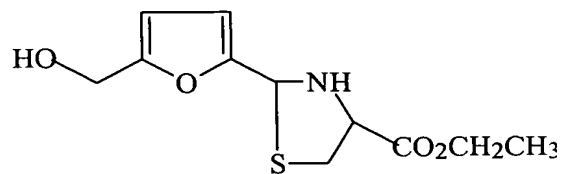
and



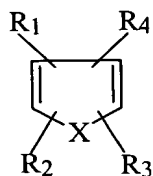
10. The method of claim 6, wherein said compound is selected from the group consisting of



and



11. A method for treating elevated bilirubin in a patient in need thereof comprising the step of administering to said patient a compound of formula



where

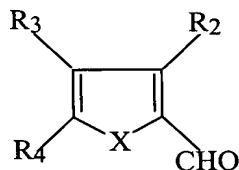
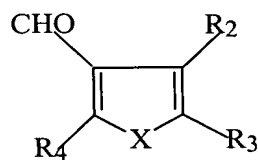
R1 is CHO, or an aldehyde protecting group;

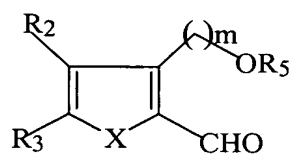
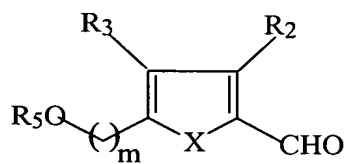
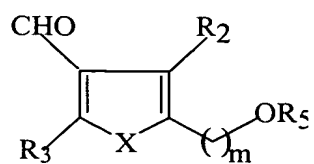
R2, R3 and R4 are the same or different and are H, OH, alkyl, alkoxy, hydroxy-alkyl, halogen, aryl or O-aryl;

and X = NH, O, S, Se or P;

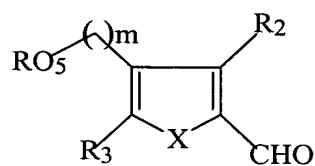
and wherein said compound is administered in sufficient quantity to ameliorate symptoms of elevated bilirubin.

12. The method of claim 11, wherein R1 is CHO; R5 is H, alkyl or aryl; and m = 1-6; said compound being selected from the group consisting of

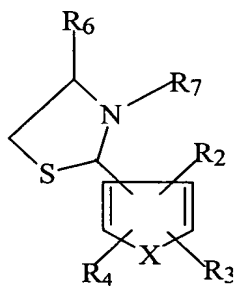




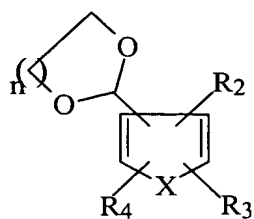
and



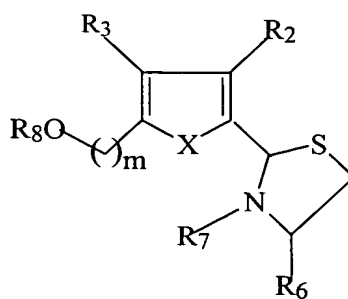
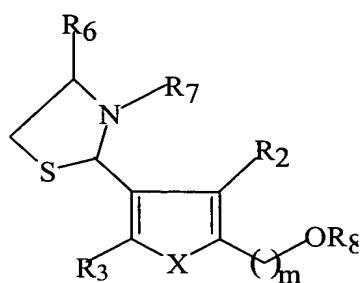
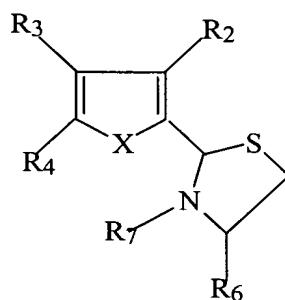
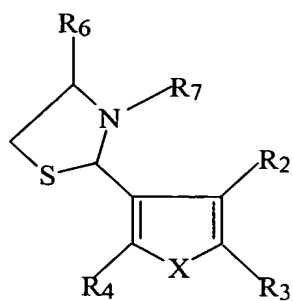
13. The method of claim 11, wherein R1 is a heterocyclic ring; R6 and R7 = H or alkyl; and n = 0-4; said compound being selected from the group consisting of

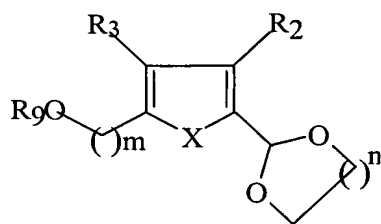
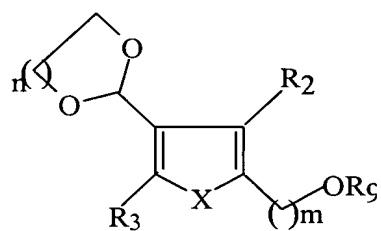
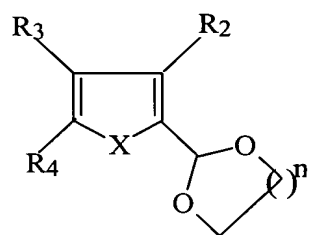
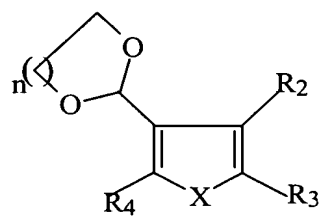
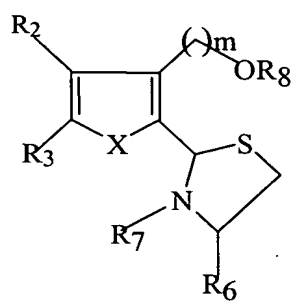


and

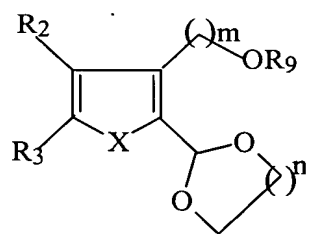


14. The method of claim 13, wherein R8 and R9 = H, alkyl or aryl, and said compound is selected from the group consisting of

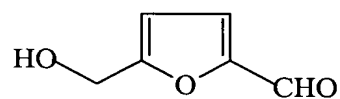
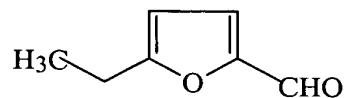
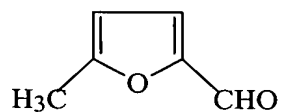




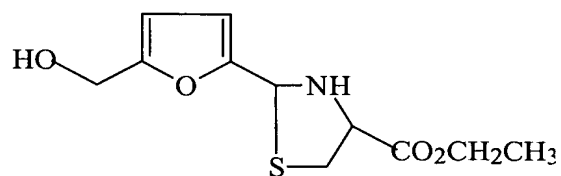
and



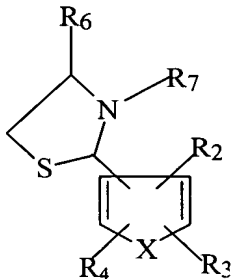
15. The method of claim 11, wherein said compound is selected from the group consisting of



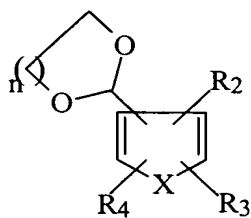
and



16. A compound selected from the group consisting of



and



where

R<sub>2</sub>, R<sub>3</sub> and R<sub>4</sub> are the same or different and are H, OH, alkyl, alkoxy, hydroxy-alkyl, halogen, aryl or O-aryl;

R<sub>6</sub> and R<sub>7</sub> are H or alkyl;

n = 0-4;

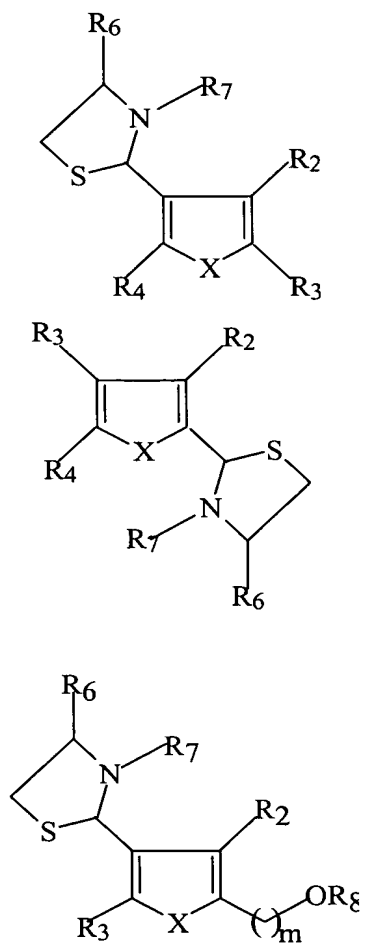
and X = NH, O, S, Se or P.

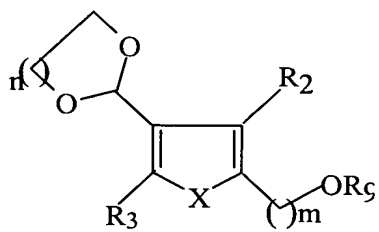
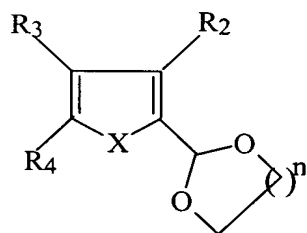
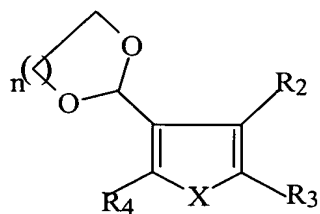
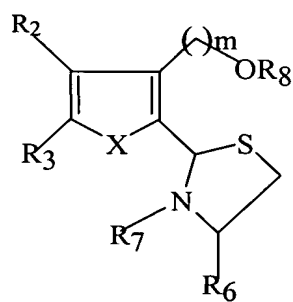
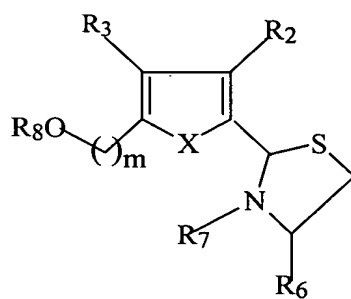
17. The method of claim 16, wherein

R<sub>8</sub> and R<sub>9</sub> = H, alkyl or aryl;

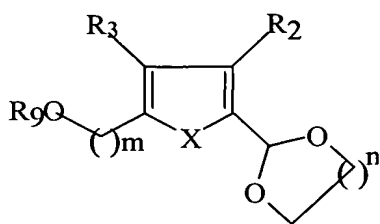
m = 1-6;

and said compound is selected from the group consisting of

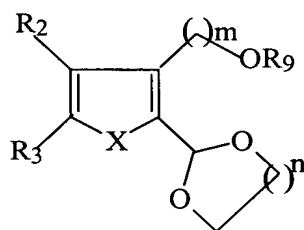








and



18. The method of claim 16, wherein said compound is

